



BRAKE CONTROLLER COMPANY



Electronic Brake Controller Hayes Brake Controller Company P/N 81770


OPERATION MANUAL


**For trailers with 2-8 electric brakes
and vehicles with 12 volt negative
ground systems only.**


READ AND SAVE THESE IN- STRUCTIONS

- Before beginning installation, read and become familiar with these instructions.
- Leave these instructions in tow vehicle for future reference.
- **IMPROPER OPERATION COULD CAUSE PERSONAL INJURY AND/OR EQUIPMENT AND PROPERTY DAMAGE.**
- Questions on installation, adjustment, trouble shooting, or operation of brake controllers:
Call **800-892-2676** Monday through Friday between 8:00 a.m. and 5:00 p.m. EST.

SAFETY INFORMATION

 **WARNING:** Indicates a potentially hazardous situation that, if not avoided, could result in death or serious personal injury.

 **CAUTION:** Indicates a potentially hazardous situation that, if not avoided, could result in damage to product or property.

 **TIP:** Contains helpful information to facilitate installation.

Automatic Operation

During braking, the Endeavor senses deceleration of the tow vehicle. An internal sensor measures the amount of deceleration and sends a proportional amount of power to the trailer brakes. The maximum braking supplied depends on the set up of the controller. The digital display will indicate the amount of power being sent to the trailer brakes. Once the brake pedal is released, the unit will return to “stand by” mode. While standing by, the controller will display the currently selected mode of display (% power, voltage, or

current). Further explanation of these modes is included in this document.

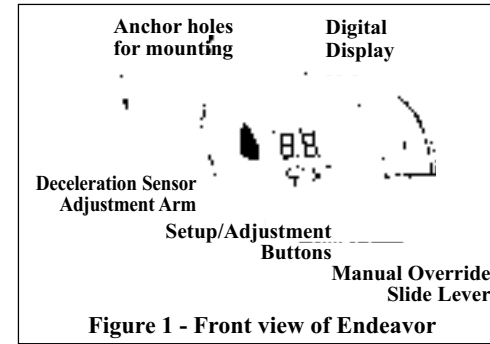


Figure 1 - Front view of Endeavor

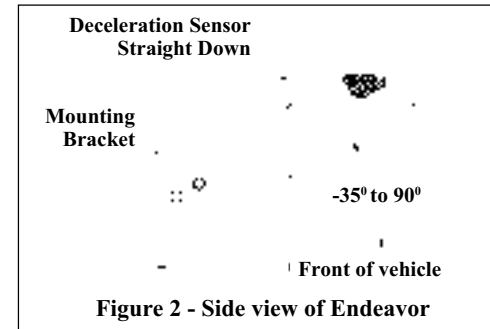



Figure 2 - Side view of Endeavor

Digital Display

The digital display shows various symbols and numbers that are used for set up and to monitor the trailer brake performance. It is also used when trouble-shooting.

Definitions of Options

-  **WARNING:**
 - Improper adjustment of the controller could result in loss of trailer brakes, aggressive, grabby, pulsating, or delayed trailer brakes.
- Power adjustments may be required based upon speed, trailer load, and road conditions.
- Maximum trailer braking occurs just prior to lockup of the trailer wheels.
- Trailer brake lockup could cause loss of control of the trailer and/or the tow vehicle.

Display mode:

- The controller is factory pre-set to display mode P (% of maximum power)
 - **During braking conditions** - the number displayed indicates the % of power being applied to the trailer brakes. The scale for this is “10”-“99.”
 - It is recommended that display mode P (or PH for a hydraulic actuator) be used while operating the vehicle.
- PH mode also displays the % of power being applied to the trailer brakes. The scale for this is “10”-“99.”
- Other available display modes:
 - Voltage (E or EH) can be used in operation, but **it should be noted** that the actual voltage supplied to the trailer brakes may vary from the

displayed value by as much as 1 Volt.

- Current (C) reading can be used in troubleshooting and setup to ensure that the amperage draw of the trailer brakes is in the proper range based on the number of axles on the trailer
 - **DO NOT** use this setting while operating the vehicle. With the manual fully on, the brake coils should draw approximately 3 amps each.
 - **DO NOT** make current readings with the manual less than full on.
 - The current reading may vary significantly due to temperature changes in the brake magnets.

Changing Display Mode


The symbols (P, E, C, PH or EH) that are displayed under non-braking conditions may be changed as follows:

1. **With the vehicle at rest**, press the “+” button until the display flashes then release the button. The display will flash a letter, which corresponds to the set display mode (P, E, C, PH, or EH).
2. To change the set mode, press the “+” button and release. The display will change from P to E to C to PH to EH with sequential presses of the “+” button.
3. Continue pressing the “+” button until the desired display mode is shown on the display.
4. Press the “-” button until the desired display mode is shown on the display.
5. The new display mode is now set.

NOTES:

- A. The P display mode is the factory default mode and is the recommended display mode. If the trailer has an Electric over Hydraulic Actuator, the PH display mode is recommended.
- B. The PH and the EH display modes do not test for a trailer connection.
- C. After a few hours of being inactive (with a trailer connected), the display will go blank. While the display is blank, very little power will be used by the Endeavor.

Minimum Power: (Manual and Automatic)

-  **CAUTION:**
 - In the automatic mode and minimum power setting at 10, noticeable braking is applied only when the sensor detects deceleration.
- With the vehicle at rest and the brake pedal depressed, there should be only a slight output to the trailer brakes (when minimum power is set to 10.)
- Higher at rest outputs and reverse braking can be obtained by increasing the minimum power setting.

The controller is factory pre-set to 10%. At this setting, the MINIMUM amount of power that will be immediately applied to the trailer brakes is 10% (when the brake pedal is depressed and before deceleration is detected).

Changing Minimum Power

Changing the minimum power level is designed to allow more or less power to be delivered to the brakes when the controller does not sense deceleration. See the loaded trailer weight guidelines table in the **Road Test and Performance Adjustment** section of this document. Select the minimum power setting required for your loaded trailer weight.

The minimum power level may be changed in 5% increments (available minimum power levels are 10, 15, 20, and 25).

To do this, follow these steps:

1. **With the vehicle at rest**, press the “-” button until the display flashes then release the button. The display will flash a number, which corresponds to the set minimum power as a percentage of total available power (10, 15, 20, and 25).
2. To change the set value, press the “-” button and release. The display will change to the next highest available value with sequential presses of the “-” button.
3. Continue pressing the “-” button until the desired minimum power level is displayed on the display.
4. Press the “+” button until display stops flashing and release.
5. The new minimum power level is now set.

NOTE: The higher the minimum power setting the more aggressive the braking. Higher at rest outputs and reverse braking can be obtained by increasing the minimum power setting.

Maximum Power: (Automatic only)

The controller is factory pre-set to 50%. When the controller senses maximum deceleration, the most power that the controller will send to the trailer brakes (with a 50 maximum power setting) will be 50%.

Changing Maximum Power (Automatic only)


Note: To change the maximum power level, the controller must be displaying P, E, C, PH, or EH (not flashing).

The maximum power may be changed from the default 50% value by doing the following:

1. **With the vehicle at rest**, press either the “+” or “-” button momentarily and release. The set maximum power will be displayed.
2. While this maximum power value is displayed, press either the “+” (increase) or “-” (decrease) button to make changes to the power setting. The power percentage will change in increments of 5% with each sequential button push.
3. The controller is instantly set to the newly displayed value.
4. When no button has been pressed for several seconds, the display will change to display mode (P, E, C, PH, or EH).

NOTE: When the value reaches 100%, the display will read “99.”

Adjusting the Deceleration Sensor

-  **WARNING:**
 - Improper adjustment of the deceleration sensor may result in poor performance of trailer brakes.
 - Brakes may be unresponsive, grabby, delayed, or pulsating.

1. Connect the trailer to the tow vehicle for this adjustment. If a load leveling hitch system is used, it should be connected and operational. Position the tow vehicle and trailer on a flat level surface. Make sure the tow vehicle stop lamps are operating correctly.
2. Set the power level to maximum (100%). See **Changing Maximum Power** section.
3. Set the display mode to “P” (% power output). See **Changing Display Mode** section.
4. Verify that the minimum power setting is 10. If not, change to 10. See **Changing Minimum Power** section.

Controller Features and Settings

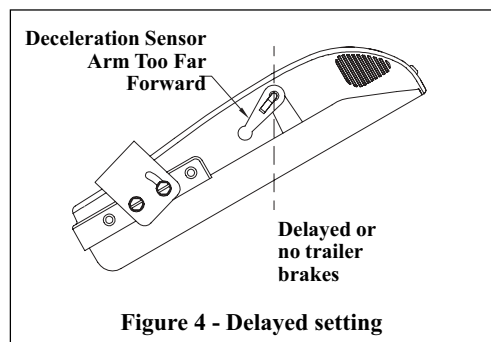
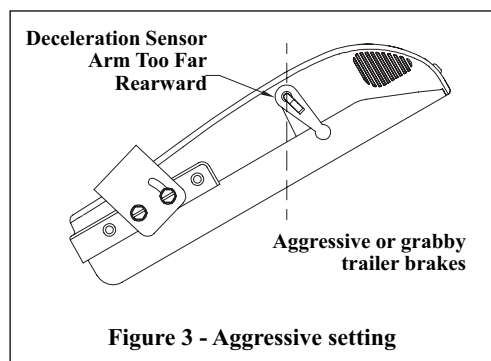
The controller features the following options, selections and settings:

HAYES BRAKE CONTROLLER COMPANY		endeavor™		Brake Controller Item # 81770 Quick Reference	
Option	Available Selections	Change Procedure			
Display Mode (P is the default mode. This mode should be used unless PH mode is required.)	P : % of available power being sent to trailer brakes (PH for hydraulic actuators E : Voltage (DC) being sent to trailer brakes (EH for hydraulic actuators) C : Current (DC) being applied to trailer brakes	<ul style="list-style-type: none"> • Press “+” button until the display flashes and release. • Display mode will flash (P, E, C, PH or EH). • Press “+” button to cycle through optional display modes. • When desired display mode is displayed, press “-” button until the flashing stops and release. • The new display mode is now set. <p>Note: PH or EH modes do not check for trailer connection and will not display “OC”.</p>			
Minimum Power (Automatic Braking only) (10% is the factory default setting.)	10, 15, 20, or 25	<ul style="list-style-type: none"> • Press “-” button until the display flashes and release. • Minimum power will flash either 10, or 15, or 20, or 25. • Press “-” button to cycle through optional settings. • When desired percentage is displayed, press “+” button until the flashing stops and release. • The new Minimum Power is now set. • The newly selected value will be displayed for several seconds. • After several seconds, the display will revert back to showing the display mode (P, E, C, PH or EH) 			
Maximum Power (50% is the factory default setting.)	5% increments from the set Minimum Power setting to 100%. 100% is displayed as “99.”	<ul style="list-style-type: none"> • Press “+” or “-” button and release • The current power setting will be displayed. • To raise the displayed power setting, press “+” button and release. • To lower the displayed power setting, press “-” button and release. When no change is made for several seconds, the displayed power setting will be stored as the current Maximum Power. The display will revert back to showing the display mode (P, E, C, PH, or EH) and stores the last selected power setting. 			

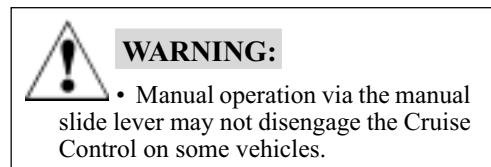
The following is a list of potential trouble codes. Refer to the installation guide for complete explanation of the codes.

Display	Code	Possible Cause
SC	Short Circuit	This indicates a direct short to ground in the blue wire (output) circuit.
CL	Current Limit	Indicates that the brake controller is providing more than its maximum rated power.
OC	Open Circuit	Indicates that there is no trailer connection detected or trailer has Electric/Hydraulic brakes.
HF	Hazard Flash	Will display while hazard flashers are on.
bF	Voltage on blue wire	Blue wire connected to wrong place, short in wiring / connector, faulty or disconnected breakaway switch.

5. Depress the brake pedal to turn on the vehicle stoplights. Hold this position.
6. Pull the deceleration sensor-leveling arm (Fig. 3) fully toward the rear of the tow vehicle. The displayed value should increase to a value greater than 10.
7. Push the deceleration sensor-leveling arm forward until the displayed value reads 10. The leveling arm should now point directly downward. (Fig. 2) Repeat steps 5, 6, and 7 several times to ensure the displayed value has just reached the minimum value 10.
8. After the initial set-up (leveling the deceleration sensor), the minimum power level may be changed from 10 (pre-set) to 15, 20, or 25 percent. Reference **Changing Minimum Power** section.
9. The maximum power level can now be lowered to a level less than the 100%. Reference **Changing Maximum Power** section.

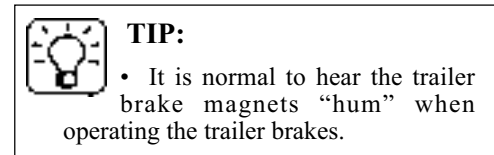


Manual Slide Lever Operation



- The “**Manual Slide Lever**” (Figure 1) is located on the front right side of the controller.
- The further the manual slide lever is moved from the right to the left, the greater the amount of trailer braking power.
- The manual slide lever operation is an independent circuit and overrides the maximum power setting to allow full braking effort when required.
- The manual slide lever is used to apply the trailer brakes independently of the tow vehicle brakes or to override the automatic trailer brakes when more braking is required.

- The manual slide lever is used in emergency stop situations when more braking may be required than is available with the maximum power setting or for control of excessive trailer sway.
- The tow vehicle and trailer brake stoplights will be illuminated during the manual lever activation.



Troubleshooting using the manual slide

To verify the brake controller is properly wired, follow these steps:

- A. Disconnect the tow vehicle/trailer electrical connector. Set the display mode to PH. Move the manual slide lever (Figure 1) to the left. The displayed value should increase and the tow vehicle stop lamps must illuminate.
- B. If SC is displayed, the tow vehicle has a short to ground in the trailer brake circuit or the white ground wire is not connected to ground. Check and/or repair wiring and tow vehicle/trailer connector.
- C. If the stop lamps do not illuminate, check the red stoplight wire connection of the brake controller for connections to the non-powered stop lamp wire of the vehicle stop lamp switch. Set the display mode to P if trailer does not have electric/hydraulic brakes.
- D. Connect the tow vehicle/trailer electrical connector.
- E. If the display flashes OC, check and repair blue wire connections and brake coil connections. The controller does not see a brake coil connection.
- F. Move the manual lever to the left. The displayed value should increase and the trailer stop lamps must illuminate.
- G. If SC or CL is displayed, check the trailer brake magnets and trailer brake circuit (including the tow vehicle/trailer connector) for a short to ground.
- H. If the trailer stop lamps do not illuminate, check and repair trailer wires, bulbs, bulb ground connections, and the tow vehicle/trailer connector.
- I. Also check the red stop light wire connection of the brake controller for connections to the non-powered stop lamp wire of the vehicle stop lamp switch.

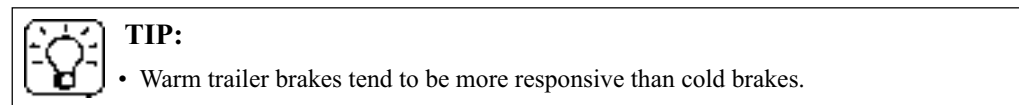
Road Test and Performance Adjustment

To set the controller up for optimum performance with your tow vehicle / trailer combination, follow these steps:

- A. Locate the tow vehicle and trailer on a hard, flat, dry surface.
- B. Set the display mode to % power (P or PH for Hydraulic Actuator). See “**Changing Display Mode**” section.

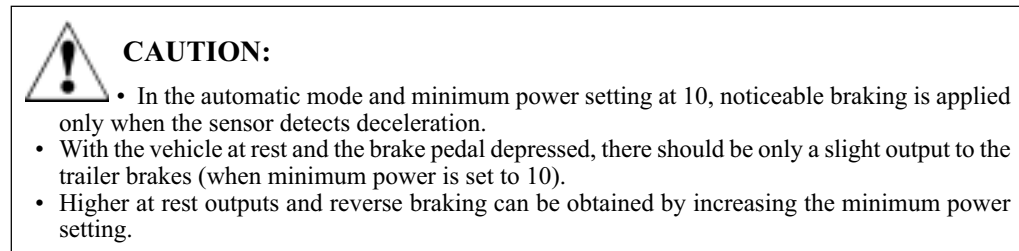
- C. Adjust the power setting to 50% using the instructions in the “**Changing Maximum Power**” section.
- D. Accelerate to approximately 25 mph and apply the brakes in a normal manner. The vehicle should come to a stop without the trailer “pushing” the tow vehicle. A firm braking action should occur.
- E. If the trailer brakes lock, decrease the power level.
- F. If more braking power is needed, increase the power level.
- G. Repeat this process until the desired amount of braking is achieved.
- H. If needed, follow the instructions in the “**Changing Minimum Power**” section to increase or decrease the minimum power. The following guidelines should be used as a starting point for selecting this option:

If the Loaded Trailer weight is . . .	Then set the Minimum Power to”
Less than the tow vehicle	10
Roughly equal to the tow vehicle	10 or 15
Slightly greater than the tow vehicle	15 or 20
Much greater than the tow vehicle	20 or 25



There are three methods of adjusting the output and responsiveness of the Endeavor Brake Controller. They are listed here in the order in which they should be modified:

1. **Maximum Power Adjustment:** The power is adjustable from 10% to 100% (if minimum power is set at 10). The maximum power level is based on the amount of power available for delivery to the trailer brakes. The total amount of power available is determined by the size and condition of the vehicle’s charging system.
2. **Minimum Power Adjustment:** - Changing the minimum power level is designed to allow more or less power to be delivered to the brakes. The initial power compensates for varying load conditions, larger trailers, and heavier loads. The initial braking (before deceleration is detected) can eliminate the feeling of being pushed by the trailer.
3. **Deceleration Sensor Adjustment:** The deceleration sensor can be either pushed slightly forward to give a delayed feel or pulled slightly backward to give a more aggressive feel. This adjustment is somewhat coarse as compared to the other two options, so it is not preferred. (Reference Fig. 3 and 4.)



NOTE: If the controller does not perform properly, check for one of the conditions shown in Figures 3 and 4.

Troubleshooting using the display

The Digital Display will “flash” a symbol to indicate a problem with the trailer, the tow vehicle, or the brake controller.

Short Circuit:

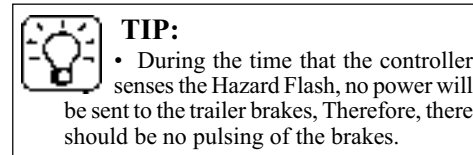
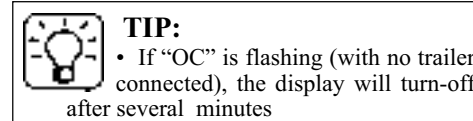
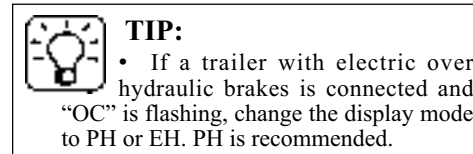
The display will flash “SC”. This indicates that the controller has sensed a direct short between the controller’s output and ground. **This condition must be cleared before the controller is used.** It is usually an indication that a “hot” wire is connected to ground.

Current Limit:

The display will flash “CL”. This indicates that the controller has sensed a power requirement greater than its recommended output. When this occurs, the controller will continue to supply all of the needed current (up to approximately 32 amps). This could result from an intermittent short to ground in the trailer wiring, a faulty brake coil, or too many brake coils connected to the controller.

Open Circuit:

The display will flash “OC”. This is an indication that there is no trailer connected to the tow vehicle. Flashing “OC” will display for a few minutes or until a trailer is connected to the tow vehicle. Connection to an electric over hydraulic trailer brakes can also cause the display to flash “OC”. The display will go blank when no load is detected for several minutes.



Hazard Flash:

The display will flash “HF”. This occurs when the controller senses a distinct cycling of power in the brake light circuit. The controller will continue to display “HF” until the cycle is broken either by a braking event or by a discontinuation of the power cycling.

Blue Wire Fault:

The display will flash “bF”. This occurs when external voltage is detected on the blue wire. The controller will continue to display “bF” until external voltage is removed. Possible causes can be the blue wire being connected to the wrong place, a short in the wiring or the connector, or a faulty or disconnected breakaway switch.

3.0 Troubleshooting

Symptom	Possible Cause	Remedy
Trailer Brakes “Lock Up”	Maximum power set too high	Reduce maximum power setting
	Minimum power set too high	Reduce minimum power setting
Low output to trailer brakes	Maximum power set too low	Increase maximum power setting
	Minimum power set too low	Increase minimum power setting
Weak/Ineffective Brakes	Overloaded trailer	Check weight rating
	Loose or poor quality connections	Inspect connections / check with meter
	Insufficient wire gauge	Inspect / replace
No output to trailer brakes	Improper wiring	Check color codes of all wires. If unsure, contact your vehicle dealership or our customer support department.
	Improperly grounded	Ensure that the following are grounded: • Controller (white wire) • Tow vehicle connector • Trailer umbilical cord • Each brake magnet
No output to trailer brakes (automatic only)	Faulty Brake Light Circuit on tow vehicle	Troubleshoot / repair brake light circuit
Intermittent or surging brakes	Improperly grounded	Check and repair all ground connections
	Out of Round brake drums	Repair / replace
	Worn wheel bearings	Repair / replace
No output to trailer brakes, display reads “SC” when brakes are applied	Direct short to ground either in tow vehicle wiring or in trailer wiring.	Inspect and repair wiring
	Faulty brake magnets	Test / replace brake magnets
Reduced output to trailer brakes, display reads “CL” when brakes are applied	Too many brake magnets are attached to controller	Controller only handles 1-4 axles with brakes
	Intermittent short to ground in tow vehicle or trailer wiring	Inspect and repair wiring
	Defective brake magnets	Test / replace brake magnets
Trailer brakes lockup when trailer connector and cable is attached.	Faulty break-away switch	Test / replace switch
Controller displays flashing “bF”	Indicates presence of an unexpected 12 volts on the blue (output) wire due to one of the following: • Faulty wiring • Malfunctioning break-away switch	Inspect wiring and break-away switch. Ensure that there is no voltage on the blue wire when the brake pedal is not depressed.
Controller displays flashing “OC”	No trailer connected	Flashing will stop in a few minutes.
	Trailer with Electric over Hydraulic actuator attached	Change display mode to PH or EH Note: These two modes do not check for a trailer connection.
	Blue controller wire not connected correct wire.	Inspect and repair wiring

If you are unable to completely remedy the symptoms using the troubleshooting guide, contact our Technical Support Service at 1-800-892-2676.